Reference D4 (CRYP2JPD2), 2000-163883
DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the optical disc and other information recording media in which record, playback, and elimination are possible, its recording and reproducing systems, and the recording and reproducing device of information.
[0002]
[Description of the Prior Art]In recent years, with digitization of the rapid increase in the amount of information processing by development of an electronic computer or an information processing system, and an information processing speed, and sound information and video information, it is large scale in a low price, and, moreover, the auxiliary storage unit in which rapid access is possible and its recording medium, especially an optical disc have spread quickly.
[0003]The basic constitution of the conventional magneto-optical disc is as follows. That is, on the disc substrate, the recording layer is formed via the dielectric layer. On the recording layer, the middle dielectric layer and the reflecting layer are formed one by one.
Furthermore on it, the Oba coated layer is formed.
Record and elimination of information raise the temperature of a recording layer by the exposure of a laser beam, and change magnetization, and reproduction of a record signal irradiates a recording layer with a laser beam, and it is carried out by detecting the rotatory polarization based on a magnetooptic effect as luminous-intensity change.
[0004]In the case of optical discs, such as DVD-ROM, DVD-RAM, and DVD-R, information is formed as two states where the recording layers which consist of a pit, or the phase change material and organic materials of unevenness of a substrate differ optically. A reflecting layer and an overcoat layer are formed on it. The regenerative signal of information is detected as a difference of the reflected light quantity between two states by the existence of a pit when it irradiates with a laser beam or a structural change, and a chemical change.
[0005]
[Problem(s) to be Solved by the Invention]In this optical disc, protection management of the disk information using postscript information available to copyright protection, such as copy protection and prevention from an unauthorized use of software, is demanded. It is possible to record disk information on the TOC (Table of Contents) field etc. which are record sections of CDC in the above optical discs. However, when disk information was recorded in a pre pit, it became the management for every La Stampa, and there was a problem that disk information for every user was not manageable.
[0006]When recording information using the thin film which consists of a magnetic film or a reversible phase change material, it is possible to make a change (alteration) of management information, i.e., unjust rewriting, easily. For this reason, there was a problem that protection management of the copyright of the contents in an optical disc, etc. could not be performed.
[0007]Also when postscript information was recorded with an irreversible record method, postscript information was reproduced, and when a recording and reproducing device to an output was possible, there was a problem that management of main information might become insufficient and injustice might be performed by the alteration of the contents of postscript information and processing.

[0008]The purpose of this invention is to provide copyright protection, such as copy protection and soft prevention from an unauthorized use, with an available optical disc. Other purposes of this invention are to provide the record method and regeneration method of such an optical disc. The purpose of further others of this invention is to provide the playback equipment of such an optical disc, a recorder, and a recording and reproducing device.
[0009]
[Means for Solving the Problem]An optical disc concerning this invention is provided with the following.
The 1st record section where it is the optical disc provided with a recording layer which records information on a disc substrate, and a recording layer recorded contents data and data for the record reproduction.
The 2nd record section that records radially subnext data about contents recorded on the 1st record section as a mark of long stripe shape.
The 1st classification on which CDC about the 2nd record section is recorded in the 2nd record section, It is provided when output inhibition data to which it should be prohibited from being outputted outside from the 2nd classification on which data to which it is not prohibited from being outputted outside from a recording and reproducing device of an optical disc is recorded, and a recording and reproducing device of an optical disc is recorded, and it consists of the 3rd classification on which output inhibition data is recorded. CDC recorded on the 1st classification includes a recognition signal which shows whether the 2nd record section includes the 3rd classification. Data recorded on the 2nd record section is recorded on a disk circumferencial direction as arranged mark rows, for example. According to this optical disc, data available to copyright protection, such as copy protection and soft prevention from an unauthorized use, is recordable on the 2nd record section.
[0010]Preferably, in the aforementioned optical disc, the 2nd record section is a field which cannot be rewritten once it writes in data. Therefore, if a content provider etc. write in data, a user cannot rewrite. Preferably, in the aforementioned optical disc, an identifier which shows whether information is recorded on the 2nd record section is recorded in data for record reproduction of the 1st record section. Thereby, an optical disc can be started in a short time.
[0011]Preferably, in the aforementioned optical disc, an identifier which shows whether information is recorded on the 2nd record section is recorded on the 1st classification of the 2nd aforementioned record section. Thereby, when data of the 1st classification is reproduced, it can be judged certainly whether data of the 3rd classification can be outputted. Preferably, in the aforementioned optical disc, it is recorded in data for record reproduction of the 1st record section of the above [an identifier which shows whether data is added and recorded on the 2nd record section, and a storage capacity of data currently recorded on the 2nd record section]. Thereby, an unjust change of data of the 2nd record section can be prevented.
[0012]Preferably, enciphered data is recorded on the 3rd classification of the 2nd aforementioned record section. Thereby, an unauthorized use of data of the 3rd classification is made more into difficulty.
[0013]Preferably, different disk ID at least for every disk is recorded on the 2nd aforementioned record section. If it records on the 2nd record section as disk ID of output inhibition, it will become impossible thereby, to guess by the operation from disk ID, where correlation with disk ID and encipherment information is completely abolished. For this reason, an illegal copy contractor can be prevented from publishing new ID unjustly.
[0014]Preferably, in the aforementioned optical disc, the 2nd record section is established in a specific part of a disk inner periphery or a disk peripheral part. Thereby, when accessing the 2nd record section, an optical head can be moved radially in a short time. Preferably, in the aforementioned optical disc, the 1st record

section includes a field which can rewrite information. Therefore, the user can do record and reproduction of data in the 1st record section.
[0015]Preferably, in the aforementioned optical disc, the 1st record section can record the aforementioned recording layer by an optical means. The aforementioned recording layer has record and elimination of multiple times possible for the 1st record section by an optical means preferably. The aforementioned recording layer consists of organic materials which change between two detectable states optically at least preferably.
[0016]Preferably, the aforementioned recording layer consists of a magnetic film which has magnetic anisotropy to a film surface perpendicular direction at least in the aforementioned optical disc. A stripe part of the 2nd record section has the magnetic anisotropy of a film surface perpendicular direction smaller than a portion between stripe parts preferably. Thereby, by changing direction of magnetization of a recording layer of an optical disc selectively, repetition record reproduction to a recording layer is possible, and a regenerative signal of postscript information can be acquired using an optical head of the same composition.
[0017]Preferably, the aforementioned recording layer consists of two or more laminated magnetic films in the aforementioned optical disc. Thereby, if a magnetic-super-high-resolution method is used as a playback system, it will become renewable [a signal in a field smaller than a laser beam spot].
[0018]Preferably, in the aforementioned optical disc, the aforementioned recording layer consists of a thin film which may change between two detectable states reversibly optically, and reflected light quantity from said 1st record section differs from reflected light quantity from said 2nd record section. Preferably, corresponding to exposure conditions of light irradiated, the phase change of the aforementioned recording layer is reversibly carried out between a crystal phase and an amorphous phase. The aforementioned recording layer consists of a germanium-Sb-Te alloy preferably.
[0019]For example, the 2nd record section consists of a portion between a stripe part which consists of amorphous phases, and a stripe part which consists of crystal phases. For example, the 2nd record section consists of a portion between a stripe part and a stripe part whose reflectance is higher than a stripe part.
[0020]In the aforementioned optical disc, data is preferably recorded on the 1st record section by providing a concavo-convex bit in a reflection film in a recording layer, Data is recorded on the 2nd record section by disk radial as a mark of long stripe shape by removing said reflection film selectively.
[0021]A regeneration method of an optical disc concerning this invention, Have at least a recording layer which records information on a disc substrate, and the aforementioned recording layer, The 1st record section that recorded contents data and data for the record reproduction, It is a regeneration method of an optical disc which plays contents from an optical disc provided with the 2nd record section that records radially subnext data about contents recorded on the 1st record section as a mark of long stripe shape. In this regeneration method, before playing contents from the 1st record section of an optical disc, It is judged whether data played from the 2nd record section contains data to which it should be prohibited from being outputted out of a recording and reproducing device of an optical disc from CDC contained in data which played data from the 2nd record section and was played from the 2nd record section. When judging that data played from the 2nd record section contains data in which an output should be forbidden, the data concerned in which an output should be forbidden is processed only inside a recording and reproducing device which is playing an optical disc, therefore is not outputted outside. It cannot perform easily carrying out the reproducing output of the data in which an output should be forbidden by this, and the contents of the data cannot be altered.
[0022]Preferably, in the aforementioned regeneration method, when judging that data reproduced from the

2nd record section contains data in which an output should be forbidden, information from the 1st record section is reproduced according to a reproduction condition in data in which an output should be forbidden.
[0023]In the aforementioned regeneration method, data for record reproduction is preferably reproduced in the 1st record section, Only when an identifier which shows existence of data in the 2nd record section is detected and this identifier is detected from data for reproduced record reproduction, the aforementioned data from the 2nd record section is reproduced.
[0024]When it is judged that data reproduced from the 2nd record section contains preferably data in which an output should be forbidden in the aforementioned regeneration method, Reference using data reproduced from the 2nd record section is performed, and only when restriction about reproduction of data recorded on the 1st record section is canceled by reference, reproduction by a decipherment and decryption of a regenerative signal of data which were recorded on the 1st record section is performed.
[0025]Preferably, in the aforementioned regeneration method, when judging that data reproduced from the 2nd record section contains data in which an output should be forbidden, an information signal is produced based on data in which an output should be forbidden, and the aforementioned production information signals are superimposed and outputted to the aforementioned contents data.
[0026]Playback equipment of an optical disc concerning this invention, Have at least a recording layer which records information on a disc substrate, and the aforementioned recording layer, The 1st record section that recorded contents data and data for the record reproduction, It is playback equipment of an optical disc which plays contents from an optical disc provided with the 2nd record section that records radially subnext data about contents recorded on the 1st record section as a mark of long stripe shape. This playback equipment is provided with the following.
An optical head which plays information from an optical disc by light spot.
The 1st regenerating section that reproduces data of the 1st record section using an optical head.
The 2nd regenerating section that reproduces data of the 2nd record section using an optical head.
The 2nd regenerating section processes data in which an output in a regenerative signal should be forbidden only inside, when data in which an output should be forbidden to the 2nd record section is recorded.
According to playback equipment of this optical disc, subnext data of output inhibition is identified easily, and it does not output outside.
[0027]A detection means by which the aforementioned playback equipment detects an identifier of whether information is recorded on the 2nd record section of an optical disc from a regenerative signal of the 1st regenerating section preferably, When a detection means detects said identifier, an optical head is moved to the 2nd record section, CDC is reproduced from the 2nd record section by the 2nd reproduction means, and it has from CDC a control means which judges whether data in which an output should be forbidden is included.
[0028]The aforementioned detection means detects said identifier preferably based on a sum signal of a detecting signal from detection light which received light with a detecting signal or two or more photo detectors from detection light which received light with one photo detector of an optical head. Since a stripe and a defect of information which were recorded on the 2nd record section can be distinguished easily by this, build up time of a device can be shortened. Compatibility can be given to playback of information even if it is an optical disc of a different playback system.
[0029]The aforementioned playback equipment has preferably a detection means to detect further existence of setting out of guard mode to data memorized in the 1st record section from data recorded on said 2nd record section. When it is detected that guard mode is set up by a detection means, the 1st regenerating

section, Only when reference using data recorded on the 2nd record section is performed and restriction about reproduction of the 1st record section is canceled by reference, reproduction by a decipherment and decryption of contents data from the 1st record section is performed. Thereby, protection and the right to access of management information, such as an individual and a company, are strengthened dramatically. Therefore, information on a data file etc. can be protected, such as preventing an unjust outflow of information.

[0030]In the aforementioned playback equipment, output inhibition data in the 2nd record section contains different disk ID for every optical disc preferably. Therefore, reference is performed using different disk ID for every optical disc.

[0031]The aforementioned playback equipment has a key production means to produce a secret key which decrypts contents data of the 1st record section further using enciphered disk ID, preferably. Preferably, the 2nd regenerating section performs reference using a secret key produced by key production means, or performs a decipherment and decryption of the 1st record section of contents data.

[0032]It is recorded on the 2nd record section of an optical disc by encryption data, and preferably, The 3rd regenerating section in which the aforementioned playback equipment decodes further encryption data reproduced by the 2nd regenerating section, It has the 1st and the 2nd mutual recognition part which are prepared for both sides of a code decoder of a signal reproduced from the 1st record section, and the 3rd regenerating section and a code decoder, and only when the 1st and 2nd mutual recognition part attests each other, a code of the 1st record section is canceled. A code is canceled, only when this reproduces enciphered main information and it attests each other.

[0033]Preferably, the 2nd regenerating section plays encryption data in which an output from playback equipment of an optical disc should be forbidden from the 2nd record section, and is further provided with a transmitting means which sends said encryption data and regenerative data from the 2nd record section of a plaintext to an external arithmetic processing unit through a path cord.

[0034]Playback equipment of the 2nd optical disc concerning this invention, Have a recording layer which records information on a disc substrate, and the aforementioned recording layer, It is playback equipment which plays contents from an optical disc provided with the 1st record section that recorded contents data and data for the record reproduction, and the 2nd record section that records radially subnext data about contents recorded on the 1st record section as a mark of long stripe shape. This playback equipment consists of an optical head which plays data from an optical disc by light spot, the 1st signal regeneration part which plays data from the 1st record section using an optical head, and the 2nd signal regeneration part which plays data from the 2nd record section using an optical head. The 2nd signal regeneration part produces an information signal based on data in which an output from a recording and reproducing device contained in regenerative data should be forbidden, and the 1st signal regeneration part superimposes and outputs said information signal produced by the 2nd signal regeneration part to a signal reproduced from the 1st record section. According to this playback equipment, it can prevent copying illegally and taking out only contents data of video information etc., and investigation of a source of contents is also attained.

[0035]The 3rd regenerating section that plays a superimposing signal which the aforementioned playback equipment is preferred and was further created using data in which an output from a recording and reproducing device of an optical disc should be forbidden, It has the 1st and the 2nd mutual recognition part which are prepared for both sides of a code decoder of a signal reproduced from the 1st record section, and the 3rd regenerating section and a code decoder, and only when the 1st and 2nd mutual recognition part attests each other, a code of the 1st record section is canceled. A code is canceled, only when this reproduces

enciphered main information and it attests each other.
[0036]The aforementioned playback equipment is provided with the following.
A means to play preferably encryption data in which an output from playback equipment of an optical disc should be forbidden from the 2nd record section at least further.
Said encryption data.
A transmitting means which sends regenerative data from the 2nd record section of a plaintext to an external arithmetic processing unit through a path cord.

[0037]A recording and reproducing device of an optical disc of this invention is provided with a recording layer which records information on a disc substrate at least, and the aforementioned recording layer, The 1st record section that recorded contents data and data for the record reproduction, It is a recording and reproducing device which performs record reproduction of contents from an optical disc provided with the 2nd record section that records radially subnext data about contents recorded on the 1st record section as a mark of long stripe shape. This recording and reproducing device is provided with the following.
A production means recorded on the 2nd record section to produce an information signal based on data including information peculiar to a disk that an output from said recording and reproducing device should be forbidden.
A means to record said produced information signal on the 1st record section as a signal superimposed on a specific signal, or to add it to the 2nd record section.
Preferably, the aforementioned superimposing signal is the watermark produced using disk ID. A superimposing signal of a watermark etc. adds a managed noise intentionally, cannot realize a perfect copy, and carries out it. It is possible to detect a watermark etc. from recorded data by this according to this recording and reproducing device. Since a history of contents can be clarified, an illegal copy and an unauthorized use can be prevented and it becomes possible to protect copyright of contents.
[0038]The aforementioned recording and reproducing device equips the 2nd record section with a watermark adjunct which adds a watermark to record ******** contents further preferably, Said watermark adjunct adds an information signal which reproduced data recorded on said 2nd record section by an optical head, and was produced based on reproduced data to said contents data as a watermark, and records said data containing a watermark on the 1st record section. Thereby, in the usual recording and reproducing system, since neither reproduction of only data superimposed from contents data nor reproduction which removes superimposed data can be performed, exclusion and an alteration of information in the 2nd record section are difficult, and can perform prevention of an illegal copy and unjust use. In this case, by adopting further a format of data of command composition which is not outputted in some data of the 2nd record section, such as ID, and the 2nd record section, It becomes possible to abolish correlation with the watermark production parameters on which contents data was overlapped, and an unjust copy by issue of inaccurate watermarks, such as ID, can newly be prevented.
[0039]The aforementioned recording and reproducing device is provided with the following.
A frequency conversion means which changes a regenerative signal from the 1st record section into a frequency axis signal from a time base signal, and creates the 1st transform signal further preferably.
A means to create mix signals which added or superimposed a signal reproduced from the 2nd record section on said 1st transform signal.
A reverse frequency conversion means which changes said mix signals into a time base signal from a frequency axis signal, and creates the 2nd transform signal.

Since the spread spectrum of the ID signal can be carried out according to this desirable example, while being able to prevent degradation of a video signal of contents data, reproduction of contents data becomes easy.

[0040]A recorder concerning this invention is provided with a recording layer which records information on a disc substrate at least, and said recording layer, It is a recorder which records contents on an optical disc provided with the 2nd record section that can record radially subnext data about contents recorded on the 1st record section for record reproduction of contents data as a mark of long stripe shape. This recorder is provided with the following.

An encoding means which enciphers contents based on data including information peculiar to each optical disc recorded on the 2nd record section.

A recording device which records enciphered contents data on the 1st record section.

The aforementioned playback equipment is preferably provided with a watermark demodulation means which plays further watermark information produced using disk ID from an input signal, When a playback result played by a watermark reproduction means shows a specific value, said recording device records a signal which enciphered said input signal on an optical disc based on said disk ID. Preferably, the aforementioned watermark demodulation means restores to a watermark using a signal which changed an input signal into frequency space from time-axis space.

[0041]Playback equipment concerning this invention is provided with a recording layer which records information on a disc substrate at least, and the aforementioned recording layer, The 1st record section that recorded contents data and data for the record reproduction, It has the 2nd record section that records radially subnext data about contents recorded on the 1st record section as a mark of long stripe shape, Contents data is enciphered and recorded and is playback equipment which plays contents from an optical disc in which disk ID peculiar to a disk is contained in subnext data. An optical head in which this playback equipment plays data from an optical disc by light spot, The 1st signal regeneration part which reproduces contents data from the 1st record section using an optical head, It consists of the 2nd signal regeneration part which plays subnext data from the 2nd record section using an optical head, and the 1st signal regeneration part is provided with a code decoder which decodes a code of contents data using disk ID played by the 2nd signal regeneration part. Preferably, the aforementioned 2nd signal regeneration part has a PE_RZ demodulation means. Preferably, the aforementioned 2nd signal regeneration part restores to subnext data, after a cut off frequency oppresses a high-frequency component for a signal which reproduced a not less than 1.2-MHz high region frequency component oppression means from owner ** and the 2nd record section by said high region frequency component oppression means.

[0042]An optical disk reproducing device concerning this invention is provided with a recording layer which records information on a disc substrate, and said recording layer, It is playback equipment which plays an optical disc provided with the 1st record section that recorded contents data and data for the record reproduction, and the 2nd record section that records radially subnext data about contents recorded on the 1st record section as a mark of long stripe shape. This playback equipment is provided with the following.

The 1st signal regeneration part which reproduces contents data from the 1st record section.

The 2nd signal regeneration part which reproduces subnext data from the 2nd record section.

A cut off frequency has a not less than 1.2-MHz high region frequency component oppression means, and the 2nd signal regeneration part restores to subnext data, after oppressing a high-frequency component for a signal reproduced from the 2nd record section by said high region frequency component oppression means. Preferably, said subreproduction means has a PE_RZ demodulation means.

[0043]
[Embodiment of the Invention]Hereafter, this invention is explained still more concretely using an embodiment. First, the structure of the optical disc which is a 1st embodiment of an invention is explained. (a) of drawing 1 is a top view of the optical disc 100 of this invention. An optical disc consists of a main information region which records the main information 110, and a postscript information area which records the postscript information 101. Although not illustrated, a lead-in groove field and a TOC area are included like the conventional optical disc in a main information region. In the case of record reproduction, if focal one is carried out in a lead-in groove field and it will be in a refreshable state, CDC (TOC) 103 of main information will be reproduced from a TOC area. CDC 103 of main information is formed as for example, a pit signal. A postscript information area is established in the specific part by the side of the inner circumference of an optical disc. However, it may provide in the specific part by the side of a periphery. Let postscript information be what can be written in only once (irreversibly) including CDC 111 about main information. Postscript information is formed in the size which is a mark (shape similar to a bar code) of long stripe shape, and can be seen for example radially with the naked eye. Main information is data (contents) which can carry out record reproduction of the user, for example, is compression video signals, such as a movie. Record reproduction is possible for the main information postscript information was indicated to be in the main information record section even if not required information but postscript information was not directly recorded on the record reproduction of main information. Postscript information is data recorded at the time of disk production, such as a serial number, and can record available management information on copyright protection, such as copy protection and prevention from an unauthorized use of software. As explained later, a part of postscript information is data in which the output from a recording and reproducing device to outside should be forbidden.
[0044]As shown in (b) of drawing 1, CDC 103 of the main information in the TOC area of the optical disc 100 contains the data about postscript information. There are the stripe existence identifier 104, a stripe storage capacity, the additional stripe existence identifier 105, and the stripe rear-face existence identifier 106 in this data. The stripe existence identifier 104 shows the existence of postscript information. In playback of an optical disc, when TOC is played, by the stripe existence identifier 104, it understands whether the postscript information (stripe) 101 is recorded, and the postscript information 101 can be played certainly.
[0045]It is shown whether the additional stripe existence identifier 105 has the added postscript information. It can forbid adding postscript information and newly making processing and change of data about disk guard mode with the postscript stripe existence identifier 105 and stripe storage capacity. Since the postscript stripe existence identifier 105 and stripe storage capacity are recorded, when the postscript information 101 on the 1st trimming is already recorded, it can calculate which capacity can record the postscript information 107 on the 2nd trimming. For this reason, when the recorder of postscript information performs 2nd trimming with TOC data, it can distinguish which is recordable. As a result, it can prevent recording not less than 360 degrees too much, and destroying the postscript information 101 on the 1st trimming. As shown in (a) of drawing 1, it can prevent destroying front trimming data by forming the blank part 108 of one or more pit signals between the postscript information 101 on the 1st trimming, and the postscript information 107 on the 2nd trimming.
[0046]The stripe rear-face existence identifier 106 shows whether postscript information is recorded on the rear face of the optical disc. If this is used, even if it is a case of the both-sides type optical disc of DVD etc., the postscript information 101 on barcode form is certainly renewable. Like DVD-ROM, when the stripe of

postscript information penetrates the reflection film of both double-sided disks, it is distinguished whether it is recorded, a field, i.e., a rear face, contrary to the field which postscript information is playing. When recorded on the rear face, the recording layer of the rear face of an optical disc is played.
[0047]Since the 1st postscript information 101 and the 2nd postscript information 107 can be identified when the number-of-times identifier of a postscript (not shown) is recorded, it becomes impossible [the record to add].
[0048]Next, the format composition of the postscript information on this embodiment is explained. Drawing 2 shows the physical format of the MBCA signal of the magneto-optical disc of postscript information which is a formula on the other hand. As shown in drawing 2, CDC 111 is contained in a MBCA signal. Here, CDC 111 is set up as 4 bytes of a synchronous code. The shortest recording cycle =30micrometer in here, a maximum radius = if it restricts to 23.5 mm, as for postscript information, the maximum capacity after a format will be limited to 188 bytes or less. the identifier of CDC 111 -- (A) -- it is distinguished by the case where a reproducing output is possible for all the MBCA data 113, and the format, in which the information 112 on output inhibition was included at the time of (B) reproduction. That is, a part of postscript information can distinguish easily whether it is an optical disc including the signal 112 with which the output from a recording and reproducing device was forbidden by CDC 111 contained in postscript information (stripe signal). the case where the byte 3 of CDC 111 is "00000000" -- all the postscript information -- the output from a recording and reproducing device -- it is refreshable and all the MBCA data 113 is reproduced. On the other hand, when CDC 111 is "00000010", 28 bytes of postscript information 112 are forbidden the output from a recording and reproducing device among 188 bytes of information included in postscript information. This data 112 is recorded as encryption data. Therefore, only 144 bytes of remaining information 113 can output outside. In the playback equipment of an optical disc, setting out of the guard mode of the recorded information on a disk is started so that it may explain later.
[0049]The data 112 in which sending out from optical-disk-recording playback equipment is forbidden specifically, It is a key for decoding the scramble of main information based on a part of information about the secret key for decoding the ID information which the information which enciphered a part of ID information of a disk and ID information enciphered the part, or ID information. In the user side, since a part of postscript information cannot carry out reproduction detection, unjust processing and alteration of MBCA data etc. of postscript information become difficult. By providing guard mode, protection and the right to access of management information, such as an individual and a company, are strengthened dramatically. Therefore, the information on a data file etc. can be protected, such as preventing the unjust outflow of information.
[0050]Below, operation of the optical disc which has the above composition is explained. In the case of the optical disc using the perpendicular magnetic anisotropy films which have a magnetooptic effect in a recording layer, record and elimination of information, A recording layer is heated by the exposure of a laser beam beyond temperature with locally small coercive force more than compensation temperature, or the temperature near Curie temperature, It is carried out by reducing the coercive force of the recording layer in the irradiation part, and making direction of an external magnetic field magnetized (record of information is performed by what is called "thermomagnetism record"). A recording layer is irradiated with the laser beam of intensity smaller than the laser beam at the time of record and elimination, and reproduction of the record signal is performed by detecting the situation which the plane of polarization of catoptric light or the transmitted light rotates according to the recorded state of a recording layer, i.e., direction of magnetization, as luminous-intensity change using an analyzer. Rotatory polarization happens based on the magnetooptic

effect what is called of a Kerr effect and a Faraday effect. In this case, in order to make interference during the magnetization for reverse small and to perform high density recording, the magnetic material which has perpendicular magnetic anisotropy is used for the recording layer of an optical disc. The material which can record information by inducing the local rise in heat or chemical change by optical absorption when it irradiates with a laser beam as a material of a recording layer is used, and at the time of reproduction. It irradiates with the laser beam from which the time of record, intensity, or wavelength differs a local change of a recording layer, and detection of a regenerative signal is performed by the catoptric light or transmitted light.

[0051](a) of drawing 3 shows the composition of the magneto-optical disc in this embodiment. On the disc substrate 131, the recording layer of the three-tiered structure which consists of the reproduction magnetic film 133, the middle interception film 134, and the recording magnetic film 135 via the dielectric layer 132 is formed. As a recording layer, several magnetic thin films in which material differs from a presentation increase the signal level at the time of information reproduction switched connection or by making it laminate one by one, carrying out magnetostatic combination, and a regenerative signal is detected. On the recording layer, the middle dielectric layer 136 and the reflecting layer 137 are laminated one by one, and the overcoat layer 138 is further formed on it. Two or more BCA sections 120a and 120b are recorded on the recording layer by the disk circumferencial direction as postscript information. Here, BCA (BurstCutting Area) means the field which recorded the mark of long stripe shape radially (in shape similar to a bar code).

[0052]Next, the manufacturing method of the magneto-optical disc in this embodiment is explained. First, the disc substrate 131 in which the guide rail or pre pit for a tracking guide was formed of the injection molding process using polycarbonate resin is produced. Subsequently, the dielectric layer 132 of 80 nm of thickness which consists of SiN films is formed on the disc substrate 131 by performing reactive sputtering to a Si target in the atmosphere containing Ar gas and nitrogen gas. The reproduction magnetic film 133 in which a recording layer consists of a GdFeCo film which are Curie-temperature Tc1, compensation presentation temperature Tcomp1, and coercive force Hc1, It is constituted by the middle interception film 134 which consists of an SiN film which is a nonmagnetic dielectric film, and the recording magnetic film 135 which consists of a TbFeCo film which are Curie-temperature Tc2 and coercive force Hc2. On the dielectric layer 132, the magnetic films 133 and 135 are produced by performing DC sputtering to each alloy target in Ar gas atmosphere, The nonmagnetic dielectric film 134 is laminated one by one by performing reactive sputtering to a Si target in the atmosphere containing Ar gas and nitrogen gas. Subsequently, the middle dielectric layer 136 of 20 nm of thickness which consists of SiN films is formed on a recording layer by performing reactive sputtering to a Si target in the atmosphere containing Ar gas and nitrogen gas. Subsequently, the reflecting layer 137 of 40 nm of thickness which consists of an AlTi film is formed on the middle dielectric layer 136 by performing DC sputtering to an AlTi target in Ar gas atmosphere. By applying said ultraviolet curing resin at the number of rotations of 3000 rpm, irradiating with ultraviolet rays, and finally, stiffening said ultraviolet curing resin by a spin coater, after ultraviolet curing resin is dropped on the reflecting layer 137, On the reflecting layer 137, the overcoat layer 138 of 8 micrometers of thickness is formed.

[0053]Here, as for the reproduction magnetic film 133, thickness is set as the presentation to which 320 ** and compensation presentation temperature Tcomp1 have magnetic anisotropy in film surface inboard at 310 ** and a room temperature in 40 nm and Curie-temperature Tc1. As for the middle interception film 134, thickness is set as 20 nm and a nonmagnetic SiN film. As for the recording magnetic film 135, 280 ** and coercive force Hc3 in the room temperature are set [thickness] as an 18-K oersted for 50 nm and Curie-

temperature Tc3, respectively.
[0054]Next, the reproduction principle in the recording layer of this three-tiered structure is explained, referring to drawing 4. The recording domain 130 of an information signal is recorded on the recording magnetic film 135. In a room temperature, the reproduction magnetic film 133 has magnetic anisotropy in film surface inboard, and moreover, since the size of magnetization of the recording magnetic film 135 is small, as for the static magnetic field from the recording magnetic film 135, magnetization is intercepted with the middle interception film 134, and is not transferred by the reproduction magnetic film 133. Therefore, by the low temperature part 129b of the laser beam spot 129a, the signal of the recording magnetic film 135 is not transferred by the reproduction magnetic film 133 at the time of signal regeneration. However, in the hot section 129c of the laser beam spot 129a. Since the temperature of the reproduction magnetic film 133 rises to near the compensation presentation temperature, magnetization of a film surface perpendicular direction is induced when magnetization of the reproduction magnetic film 133 decreases, and magnetization of the recording magnetic film 135 moreover becomes large by a rise in heat, In order that the magnetic connection by a static magnetic field may work, the direction of magnetization of the reproduction magnetic film 133 is transferred in the direction of the recording magnetic film 135. For this reason, the recording domain 130 of an information signal will be in the state where the mask of the low temperature part 129b which is a part of laser beam spot 129a was carried out. Therefore, it becomes renewable [a record signal] only from the hot section 129c of the center section of the laser beam spot 129a. This playback system is composition which the static magnetic field by forming the middle interception film 134 between the reproduction magnetic film 133 and the recording magnetic film 135 commits, And since the signal of the recording magnetic layer 135 transfers only the high temperature portion of the center of the light spot 129a to the reproduction magnetic film 133, It is a magnetic-super-high-resolution method called "CAD (Center Aperture Detection)" by a static magnetic field method, and becomes renewable [the signal in a field smaller than a laser beam spot] by using this playback system. On the other hand, magnetic super high resolution is a formula, and CAD means the method of detecting a signal only from a center section with a high temperature in which the laser beam spot carried out temperature up. "FAD" using the switched connection power between each magnetic layer which can reproduce the low temperature part of a laser beam spot to a signal, Or the same reproduction is attained even if it is a case where the magnetic-super-high-resolution method called "RAD" which can reproduce a signal only from the hot section of a laser beam spot is used.
[0055]Next, record of the postscript information in this magneto-optical disc is explained, referring to drawing 5. (a) of drawing 5 shows the laser recorder of the postscript information in an embodiment of the invention, and (b) shows the optical composition of this recorder. Since postscript information makes it common use with the recording and reproducing device of the disk for DVD, RZ (Return to Zero) record is used as a recording method of postscript information, and the format of the record signal also makes it compatible technical contents.
[0056]First, direction of magnetization of the recording layer of the magneto-optical disc 140 is arranged with one way using a magnetization machine (not shown). Since the recording magnetic films 135 of a recording layer are perpendicular magnetic anisotropy films which have the coercive force of an 18-K oersted, they can arrange direction of magnetization of a recording layer with one way by setting the magnetic field strength of the electromagnet of a magnetization machine as 20 kilogausses, and passing the magneto-optical disc 140. It is inputted into the input part 409, and disk ID is enciphered by the code encoder 430, next disk ID (postscript information) generated by the serial number generating part 408 is coded with

ECC encoder 407. Next, in the PE-RZ modulation part 410, it becomes irregular corresponding to a modulation clock, and is sent to the laser-light-emitting circuit 411. Subsequently, as shown in the condensing part 414 of (b), a one-way convergent lens like the high output laser 412, such as an YAG laser, and the cylindrical lens 417 is used, The laser beam of the stripe shape of a long rectangle is radially completed on the recording layer of the magneto-optical disc 140, and two or more BCA sections 120a and 120b (refer to (a) of drawing 3) are recorded on a disk circumferencial direction. If the BCA sections 120a and 120b are detected, PE (phase encoding) recovery is carried out from the recorded signal using a BCA reader (not shown) and it is in agreement with record data as compared with record data, record of postscript information will be completed. Since the range of fluctuation of reflectance will be 10% or less in the case of this magneto-optical disc, there is no influence in focus control.

[0057]Next, the reproduction principle of the BCA signal of postscript information is explained. Drawing 6 shows the car hysteresis loop in a direction vertical to the film surface of the BCA section 120a shown in (a) of drawing 3, and the non-BCA section 120c. It turns out that the car angle of rotation and perpendicular magnetic anisotropy of the BCA section 120a which are heat-treated by stripe shape have deteriorated substantially. Thus, since the BCA section 120a is heat-treated by the exposure of the laser beam, perpendicular magnetic anisotropy is low (the magnetic anisotropy of field inboard is dominant) and the residual magnetization in the film surface perpendicular direction is lost, it becomes impossible to perform magneto-optical recording, and a detecting signal is not outputted. However, when portions (non-BCA section 120c) other than the BCA section of a recording layer glare. Since that portion is magnetized by one way vertical to a film surface, the regenerative waveform of the postscript information by the differential signal by rotatory polarization as the plane of polarization of catoptric light rotated, and the differential signal of the photodetector (PD) divided into two outputted and shown in (b) of drawing 3 as a result is obtained. As mentioned above, the signal of the postscript information on the BCA section is promptly detectable from a BCA regenerative signal using the optical head for magneto-optical recording reproduction.

[0058]Actually the record power of the BCA record in the case of a magneto-optical disc, A BCA signal is recordable from the optical injection side side of a magneto-optical disc using the BCA trimming equipment by Matsushita Electric Industrial Co., Ltd. of composition as shown in drawing 5 (BCA recorder (YAG laser 50W lamp excitation CWQ pulse recording)).

[0059]Next, the recording and reproducing device of a magneto-optical disc is explained, referring to drawing 7 and drawing 8. In the case of optical discs, such as DVD-ROM or DVD-RAM, and DVD-R, although the detecting method of composition and a regenerative signal differs from the optical head of optical composition as shown in drawing 8, as shown in drawing 7, the basic constitution and basic motion of playback equipment of an optical disc are common.

[0060]Drawing 8 shows the optical composition of the recording and reproducing device of a magneto-optical disc. In the optical head 155, the laser beam of the linear polarization ejected from the laser light source 141 driven by the pulse generation laser drive circuit 154 is changed with the collimate lens 142, and turns into a laser beam of a parallel beam. The polarization beam splitter 143 is passed, it is condensed on the magneto-optical disc 140 with the object lens 144, and only P polarization is irradiated with this laser beam by the recording layer of the magneto-optical disc 140. At this time, the information on the usual record data (main information) is recorded by changing selectively the direction of magnetization of perpendicular magnetic anisotropy films (facing up and facing down), and the catoptric light (or transmitted light) from the magneto-optical disc 140 changes as rotatory polarization according to the magnetized state by a

magnetooptic effect. Thus, the catoptric light which carried out rotatory polarization is separated into the direction of signal regeneration, and a focal tracking control direction by the half mirror 146 after being reflected by the polarization beam splitter 143. After a plane of polarization rotates 45 degrees of lights separated in the direction of signal regeneration with the lambda/4 board 147, a direction of movement is divided into P polarization component and each S polarization component by the polarization beam splitter 148. The light divided into the 2-way is detected as each light volume with the photo detectors 149 and 150. And change of rotatory polarization is detected as a differential signal of the light volume detected with the two photo detectors 149 and 150, and the regenerative signal of data information is acquired by this differential signal. The light of the focal tracking control direction separated with the half mirror 146 is used for the focus control of the object lens 144, and TORRAKKINGU control by the focal TORRAKKINGU light sensing portion 153. The magnetic head 151 is driven by the magnetic head driving circuit 152.

[0061]The BCA field which is the postscript information on a magneto-optical disc is detected using the same playback system as main information. As for the BCA sections 120a and 120b ((a) of drawing 3) heat-treated, perpendicular magnetic anisotropy has deteriorated substantially (hysteresis loop 120a of drawing 6). Since direction of magnetization at the time of production of a recording layer or reproduction of a signal of perpendicular magnetic anisotropy films is arranged with one way, according to direction of magnetization of the plane of polarization, only thetak rotates to one way and the laser beam which entered into the large non-BCA sections 120c and 120d of perpendicular magnetic anisotropy which are not heat-treated is reflected in it. On the other hand, it is heat-treated, and in the BCA sections 120a and 120b in which perpendicular magnetic anisotropy has deteriorated substantially, since the car angle of rotation is very small, the laser beam which entered is reflected, without the plane of polarization hardly rotating.

[0062]As a method of arranging direction of magnetization of perpendicular magnetic anisotropy films with one way at the time of playback of a BCA field, here using the recording and reproducing device of the magneto-optical disc of drawing 7, It is possible by impressing the fixed magnetic field of 200 or more oersteds to the magneto-optical disc 140 by the magnetic head 151, irradiating with a not less than 4-mW laser beam so that the recording magnetic film 135 of the recording layer of the magneto-optical disc 140 may become more than Curie temperature. as a result, the differential signal same as change of the deflection direction of a recording layer as main information detects the postscript information on a BCA field -- it can do.

[0063]In this embodiment, although the differential signal has detected postscript information, since light volume fluctuation components without polarization are mostly cancellable if this playback system is used, when reducing the noise by light volume change, it is effective.

[0064](a) of drawing 9 and (b) show the regenerative waveform at the time of actually detecting postscript information by the recording current 8A, respectively. (a) is a waveform photograph of a differential signal here, and (b) is a waveform photograph of a summed signal. As shown in (a), it turns out that the pulse shape of the identification information of gain sufficient in a differential signal is detected. Since change of an average refractive index is 5% or less even if a recording layer is change of only magnetic properties and it is a case where a part of recording layer crystallizes, at this time, change of the reflected light quantity from a magneto-optical disc will be 10% or less. Therefore, change of the regenerative waveform accompanying change of reflected light quantity is dramatically small. At this time, by setting the recording current of a laser beam as 8-9A, the regenerative waveform indicated to be (a) of drawing 9 to (b) is obtained, a BCA image is observed by only the polarization microscope, and it cannot observe with an optical microscope.

[0065]The method of recording BCA ****** as postscript information in this embodiment, after arranging

direction of magnetization of the recording magnetic film 135 of a recording layer with one way (after magnetizing), Or how to impress the magnetic field of one way is explained, irradiating with a laser beam the disk which recorded the BCA signal using the recording and reproducing device. However, it is also possible to arrange direction of magnetization of the perpendicular magnetic anisotropy films of a recording layer with one way, irradiating with a strobe light etc. and raising the temperature of a recording layer.
[0066]The recording layer 35 of this magneto-optical disc has the coercive force of an 18-K oersted at a room temperature. However, since, as for coercive force, below a 6-K oersted will become if it irradiates with a strobe light, a laser beam, etc. and temperature up is carried out to not less than 100 **, Direction of magnetization of a recording layer can be arranged with one way by impressing the magnetic field more than the 8-K oersted which is a magnetic field smaller than the magnetic field in the case of magnetizing at a room temperature.
[0067]Although the recording layer in this magneto-optical disc is a three-tiered structure which consists of the playback magnetic film 133, the middle interception film 134, and the recording magnetic film 135, Postscript information is recordable by reducing remarkably the magnetic anisotropy of a direction vertical to the film surface of the portion which heat-treated the recording magnetic film 135 at least, and considering it as the characteristic with the almost dominant magnetic anisotropy of field inboard.
[0068]The same effect is acquired even if it is a case where the perpendicular magnetic anisotropy of all the magnetic films of the perpendicular magnetic anisotropy of at least one magnetic film or the reproduction magnetic film 133, the middle magnetic film 134, and the recording magnetic film 135 is degraded among the reproduction magnetic film 133 and the recording magnetic film 135.
[0069]Curie temperature, coercive force, etc. of a magnetic film which constitute a recording layer, By addition of the various elements in which selection of a presentation differs from the size of perpendicular magnetic anisotropy, since it can change comparatively easily, according to the record reproduction conditions required of a magneto-optical disc, the composition of the recording layer of a magneto-optical disc, and manufacturing conditions and the recording condition of postscript information can be set up the optimal.
[0070]In this magneto-optical disc, the GdFeCo film, the TbFe film, and the TbFeCo film are used as an SiN film and a magnetic film as polycarbonate resin and the dielectric layers 132 and 136 as the disc substrate 131, respectively. However, plastics, such as glass or polyolefine, and PMMA, can be used as the disc substrate 131. As the dielectric layers 132 and 136, the film of the film of other nitrides, such as AlN, the film of oxides, such as TaO_2, the film of charcogen compounds, such as ZnS, or the mixture using these two or more kinds can be used. As a magnetic film, the magnetic material which has perpendicular magnetic anisotropy, such as a rare earth metal-transition metal system ferrimagnetism film in which material differs from a presentation or MnBi, and PtCo, can be used. The much more composition [try] may be used also for the composition of a recording layer, and also it may be multilayer composition.
[0071]Here, the procedure of the regeneration method using postscript information is explained using the flow chart of drawing 10 and drawing 11. a disk inserts -- having (Step 302) -- tracking being set to a focus (Step 301a), and first, By a normal disk, focal one is carried out in a lead-in groove field, it will be in a refreshable state (Step 301b), and TOC (Control Data) will be played (step (301c).). When a lead-in groove field or TOC is not reproduced here, it becomes an error and stops.
[0072]Since the stripe existence identifier 104 is recorded by the pit signal in TOC of TOC area 103 of main information as shown in drawing 1, when TOC is reproduced, it understands whether postscript information (stripe) is recorded. Then, 0 or 1 is first distinguished for the stripe existence identifier 104 (Step 301d).

When the stripe existence identifier 104 is 0, an optical head moves to the peripheral part of an optical disc, it changes to rotation phase control, and playback is performed for the data of the data area 110 of the usual main information (Step 303).

[0073]The identifier of the main information which shows the existence of the existence of postscript information is detected based on the sum signal of the detecting signal from the detection light which received light with the detecting signal or two or more photo detectors from the detection light which received light with at least one photo detector of an optical head. When said identifier is detected and existence of said postscript information is checked, said optical head is moved to the specific part of said optical disc in which said postscript information was recorded if needed. According to this composition, a stripe, a defect, etc. of postscript information can be distinguished easily. For this reason, the build up time of a device can be shortened, and compatibility can be given to playback of postscript information even if it is an optical disc of a different playback system.

[0074]When the stripe existence identifier 104 is 1 next, by a double-sided type disk, it is distinguished like DVD-ROM whether it is recorded on the field contrary to the field which the stripe is playing, i.e., a rear face, (Step 301e). (is the rear-face existence identifier 106 1 or 0?) When the rear-face existence identifier 106 is 1, the recording layer of the rear face of an optical disc is played (Step 301p). In the case of the magneto-optical disc of single plate structure, the rear-face identifier 106 is always 0. When the rear face of an optical disc is automatically unreproducible depending on playback equipment, "rear-face reproduction instruction" is outputted and displayed. When it is judged that the stripe is recorded on the field under reproduction at Steps 301d and 301e, It moves to the field 101 of the stripe of the inner periphery of an optical disc, and an optical head changes to rotational speed control, carries out CAV rotation, and plays the signal 111 of the TOC area of a stripe (Step 301f).

[0075]Here, when the field 112 where the output from a recording and reproducing device should be forbidden into a stripe signal does not exist by reproduction of the signal 111 of the TOC area of the stripe 101, (Step 301g) and the signal 113 of a stripe are reproduced (Step 304a). Next, when it is distinguished whether reproduction of the signal 113 of a stripe was completed (Step 304b) and reproduction of the signal 113 of a stripe is completed, An optical head moves to the peripheral part of an optical disc, it changes to rotation phase control again, the usual CLV reproduction is performed, and the data of the pit signal with which the signal 113 of the stripe was added, or main information is played (Step 304c).

[0076]When the information signal 112 with which the output from a recording and reproducing device is forbidden in the stripe signal exists by playback of the signal 111 of the TOC area of a stripe, setting out of the guard mode of the recorded information on YES) and a disk is started at 301 g of (steps. First, the command of guard mode is set up and the remaining postscript information 112 and 113 is reproduced (Step 301h). Here, when guard modes other than the command which can be set up are set as the optical disc, it becomes an error and playback of a disk stops.

[0077]If the command of guard mode is set up and reproduction of the postscript signals 112 and 113 of a stripe is completed (Step 301i), detection of a secret key will be performed from enciphered media ID (Step 301j). Here, said media ID is a signal which modulates encryption or information and has been recorded, and since it is the information 112 to which the output from a recording and reproducing device is forbidden, it is unreproducible by the user side at the time of playback of a disk. Next, the reproduction command of the data file protected is set up using the information signal produced using said secret key or it (Step 301k). Here, when set as the data file of guard modes other than the command which can be set up, it cannot go into the reproduction mode of a protection file. Setting out of the reproduction command of the data file protected

will start decoding of a protection file (3011. of steps). When decoding of a protection file is not completed, it repeats from the check (Step 301k) of the information on a secret key again. Here, when the reproduction command of a protection file cannot be set up as for more than a fixed count, playback of a disk stops as an error (301 m of steps). If decoding is completed, a file is closed, guard mode is canceled (Step 301n), and the data of main information other than a protection file will be in a refreshable state.

[0078]Also when decoding of a protection file is not completed (it is NO at 301 m of steps), it repeats from setting out (301k) of the reproduction command of data again. Here, playback of a disk is ended also when a reproduction command is not set up as for more than prescribed frequency.

[0079]Playback of the stripe 101 is completed, when guard mode is canceled, (Step 301n) and an optical head move to the peripheral part of an optical disc (Step 303), and it changes to rotation phase control again, and playback of the data of the usual pit signal and the data of the signal of main information is performed.

[0080]Thus, the stripe 101 is certainly renewable by recording the stripe existence identifier 104 on pit regions, such as TOC. A part of postscript information on a stripe can distinguish easily whether it is an optical disc including the signal 112 with which the output from a recording and reproducing device was forbidden by CDC 111 contained in a stripe signal.

[0081]Next, it explains still more concretely about the system which consists of optical-disk-recording playback equipment shown in drawing 12, and a personal computer. The optical-disk-recording playback equipment 320 sends the information on the optical disc 140 to the personal computer 322 via the SCSI interface 321. Information is processed by CPU323 in a computer, and information is kept in the memory area 324. Although explained using SCSI as an interface, ATAPI, 1394, USB, etc. should just be the composition which can carry out the transmission output of the postscript information together with the signal of main information.

[0082]Here, in the optical disc of the conventional composition, in order to judge whether use of the reproduction information of main information, processing, a copy, etc. are possible, postscript information, including a BCA signal etc., was also doubled and played, and it used for processing of main information. However, it may have been decoded though ID information etc. were enciphered, since all the contents of postscript information were reproduced and it outputted on a computer. By this embodiment, an output is forbidden to a part of postscript information, and since the information used only within the drive may be included, the regeneration in that case is explained.

[0083]Drawing 13 is a flow chart of the regeneration method of the MBCA signal which is the postscript information in the optical disc of this embodiment. First, a MBCA reproduction command is inputted via the interface 321 from the computer 322 for reproduction of a MBCA signal (Step 311a). Then, if a reproduction command is received, the optical-disk-recording playback equipment 320 reads a MBCA signal (Step 311b), and stores it in the memory of the optical-disk-recording playback equipment 320.

[0084]Next, in the case of the MBCA signal of format composition as shown in drawing 2, the byte 3 of CDC of MBCA is reproduced first (Step 311c). Since all MBCA data is sent out when the byte's 3 contents are 00h (Step 311d), It is outputted on the computer 322 through connection of the interface 321 (Step 311h), and all the contents of the MBCA signal can be checked with the personal computer 322 as usual.

[0085]However, since all MBCA data cannot be sent out when the byte's 3 contents are 02h, it is divided into the data which can send out MBCA data, and the data to which sending out from optical-disk-recording playback equipment is forbidden (Step 311e). And only the data in which sending out in MBCA data is possible is sent out from a recording and reproducing device (Step 311f), and it is outputted on the computer 322 through connection of the interface 321 (Step 311h).

[0086]On the other hand, about the data to which sending out from the optical-disk-recording playback equipment in MBCA data is forbidden, within optical-disk-recording playback equipment, although played (311g of steps), since it is not outputted out of a device, it is used only within an optical disk drive (Step 311i). Therefore, on the computer 322, since all the contents of the MBCA signal cannot be checked, the decipherment of postscript information peculiar to disks, such as ID information, becomes impossible. For this reason, protection of the contents currently recorded as main information becomes more powerful. Thus, in the case of an optical disc including the signal 112 with which the output from a recording and reproducing device was forbidden to a part of postscript information on a stripe. It is impossible to play the stripe information 112 about disk ID or a secret key by the user side, and the optical disc protected in main information very powerfully and its recording and reproducing systems can be realized.
[0087]Although an optical disc is played with the above-mentioned reproduction procedure, demodulation operation is briefly explained using the recording and reproducing device of the optical disc of drawing 7. In the optical disc 140a on which the BCA signal of postscript information was recorded, the stripe existence identifier 104 (refer to drawing 1) which shows whether BCA exists in CDC 103 of main information is recorded. It is the composition that the transparent substrate of two sheets was stuck so that the signal surface side 10a may come to inside like ROM disk 10 in a double-sided type case, and it may be two-layer [of the case where the number of the recording layers 10a is one, and the recording layers 10a and 10b]. When a recording layer is two-layer, the stripe existence identifier 104 which shows whether BCA exists in CDC of the 1st recording layer 10a near the optical head 155 is recorded. In this case, since BCA exists in the 2nd recording layer 10b, first, a focus is doubled with the 1st recording layer 10a, and the optical head 155 is moved to the radius position of CDC which exists in the most inner circumference of the 2nd recording layer 10b. since CDC is main information -- the 1st demodulation section 528 -- EFM or 8-15 -- or it becomes irregular eight to 16 times. Only when the stripe rear-face existence identifier 106 in this CDC is '1', by one layer and the two-layer part changeover section 597, a focus is doubled with the 2nd recording layer 10b, and BCA is reproduced.
[0088]It is read in the optical disc 140 by the optical head 155, and if the photo-regenerating signal (high frequency signal) of the main information separated by the frequency separation means 534 is sliced with the 1st general slice level 515 using the 1st level slicer 590, it will be changed into a digital signal. It restores to this signal by the EFM demodulation section 525, the 8-15 abnormal-conditions demodulation section 526, or the 8-16 abnormal-conditions demodulation section 527 in the 1st demodulation section 528, It is decoded by ECC decoders 536, and further, by the code decoder 534a, MPEG decoder 261, and the watermark reproduction collating part 262, required processing is carried out and it is outputted. Thus, recovery reproduction of the main information is carried out by the 1st demodulation section 528. CDC in this main information is reproduced, and only when the stripe existence identifier 104 is '1', it goes BCA to reading. When the stripe rear-face existence identifier 106 is '1', CPU523 takes out directions to one layer and the two-layer part changeover section 597, drives the focus part 598, and changes a focus from the 1st recording layer 10a to the 2nd recording layer 10b. Simultaneously, the optical head 155 is moved to the radius position (BCA which is recorded among 22.3 to 23.5 mm by the side of the inner circumference of CDC in the case of the DVD standard) of the record section 101 of postscript information, and BCA is read.
[0089]In a BCA field, the signal with which the envelope as shown in the "regenerative signal" of (c) of (4) was selectively missing is reproduced. [of drawing 1] The low frequency signal of the photo-regenerating signals by setting up the 2nd slice level 516 of light volume lower than the 1st slice level 515 in the 2nd level slicing part 529, The BCA section without the rotatory polarization of BCA or the BCA section which lacked

the reflecting layer is detected, and a digital signal is reproduced. It gets over by the PE-RZ demodulation section 530a of the 2nd demodulation section 530, ECC decoding is carried out by ECC decoders 530b, and this signal lets the BCA outputting part 550 pass, and is outputted as BCA data which is postscript information. Thus, recovery reproduction of the BCA data which is postscript information in the 2nd demodulation section 530 is carried out.

[0090]However, in the magneto-optical disc of this embodiment, when an output should be forbidden by CDC 111 of postscript information. Since the postscript information 112 forbidden the output is not outputted through the BCA outputting part 550, only the regenerative signal of the remaining refreshable postscript information 113 is outputted out of a recording and reproducing device.

[0091]Here, operation of the demodulation output circuit of the MBCA signal in optical-disk-recording playback equipment is explained. As shown in drawing 14, by the 2nd demodulation section 530, the regenerative signal of MBCA carries out a PE-RZ recovery, and is reproduced (Step 314a), and ECC error correction is carried out by ECC decoders 530b (Step 314b). And the 2nd demodulation section 530 memorizes (Step 314c). Here, the address counter of the information the MBCA signal is remembered to be is set up by CDC 111 of MBCA (Step 314d). When the byte 3 of CDC 111 is 00h, the counter of read-out is specifically set as 4, and when the byte 3 is 02h, the counter of read-out is set as 32. And the MBCA information on the address after the set-up counter is reproduced, and it is outputted with video information via an interface from the BCA outputting part 550. As a result, use of some data of MBCA which is postscript information is attained only within a drive, without being outputted from a recording and reproducing device. The position of the address of a read counter is arbitrarily extensible by setting a reproduction command as a different address.

[0092](a) of drawing 15 is a sectional view showing the composition of the phase change type optical disc in a 2nd embodiment of this invention. On the disc substrate 311, the recording layer 313 which consists of a phase change material which may change between a crystal phase and amorphous phases reversibly via the dielectric layer 312 is formed. Thereby, information is recordable using the difference in the optical characteristic based on the reversible structural change with the atom level between a crystal phase and an amorphous phase, and information is renewable as a difference of the reflected light quantity or the transmitted light amount to specific wavelength. In the field in which postscript information was recorded, it is preferred that the difference of the reflected light quantity between the phases of two states of the light irradiated is not less than 10% in this case. According to this desirable example, the regenerative signal of the 2nd record section that is postscript information can be acquired certainly, and detection of reproduction information becomes easy. Two or more BCA sections 310a and 310b are recorded on the BCA field of the recording layer 313 by the disk circumferencial direction. On the recording layer 313, the middle dielectric layer 314 and the reflecting layer 315 are laminated one by one, and the overcoat layer 316 is further formed on it. And the disk of two sheets with which only the 1st optical disc has the overcoat layer 316 is stuck by the glue line 317. It may be the composition that the optical disc of two sheets of the same composition was stuck by the hot melt method. The optical disc provided with the recording layer which consists of the above thin films which may change between two detectable states reversibly optically is applied to DVD-RAM etc. as a commutative medium which it is high-density and can be rewritten.

[0093]Although an above-mentioned optical disc pastes the disk of two sheets together, (c) of drawing 15 shows the composition of the phase change type optical disc which consists only of a disk of one sheet. Although it differs in that the 10-nm-thick phase change type recording layer 160 is formed in the middle of the 100-nm-thick dielectric layer 132 and the 10-nm-thick middle dielectric layer 136, others have the same

structure. Since it is a disk of the lamination of two sheets in DVD-RAM or DVD-RW, the substrate 131a and the glue line 138a are added.

[0094]In the optical disc which corresponds to the exposure conditions of the light irradiated and in which a recording layer carries out a phase change reversibly between a crystal phase and an amorphous phase, If formation of the BCA section is explained, for example in the 2nd record section, the bar code part of a barcode form pattern is formed by an amorphous phase, and between bar codes can be formed by a crystal phase. After, forming the recording layer of low reflectance by an amorphous phase by forming a recording material layer on a substrate for example, a portion corresponding between the bar codes of the 2nd record section is irradiated with laser, and a barcode form pattern is formed by forming the recording layer of high reflectance.

[0095]Although the phase change material of the GeSnTe alloy was used in the above-mentioned optical disc, even if it uses organic materials or other phase change materials, and the material that changes structurally, what is necessary is just the material which changes optically between two states.

[0096]In optical discs (not shown), such as DVD-ROM, postscript information which main information is recorded on the 1st record section by the pit of unevenness of a reflection film, etc., and is different for every disk, or its enciphered postscript information on output inhibition is recorded on the 2nd record section. If disk ID of output inhibition is recorded on postscript information, it will become impossible to guess by the operation from disk ID, where correlation with disk ID and encipherment information is completely abolished. For this reason, an illegal copy contractor can prevent publishing new disk ID unjustly. When main information is recorded on the 1st record section by the pit of unevenness of a reflection film, etc., postscript information can be recorded by removing a reflection film selectively.

[0097]Next, the manufacturing method of this optical disc is explained. First, the disc substrate 311 in which the guide rail or pre pit for a tracking guide was formed of the injection molding process using poly car bow NETO resin is produced. Subsequently, the dielectric layer 312 of 80 nm of thickness which consists of a $ZnSSiO_2$ film is formed on the disc substrate 311 by performing high frequency (RF) sputtering to a $ZnSSiO_2$ target in Ar gas atmosphere. Subsequently, the recording layer 313 of 10 nm of thickness which consists of a GeSbTe alloy is formed on the dielectric layer 312 by performing RF sputtering to a GeSbTe alloy target in Ar gas atmosphere. Subsequently, it is from a $ZnSSiO_2$ film on the recording layer 313 by performing RF sputtering to a $ZnSSiO_2$ target in Ar gas atmosphere. The middle dielectric layer 314 of 10 nm of thickness is formed. Subsequently, the reflecting layer 315 of 40 nm of thickness which consists of an AlCr film is formed on the middle dielectric layer 314 by performing DC sputtering to an AlCr target in Ar gas atmosphere. Subsequently, by applying said ultraviolet curing resin at the number of rotations of 3500 rpm, irradiating with ultraviolet rays, and stiffening said ultraviolet curing resin by a spin coater, after ultraviolet curing resin is dropped on the reflecting layer 315, On the reflecting layer 315, the overcoat layer 316 of 5 micrometers of thickness is formed. Thereby, the 1st optical disc is obtained. On the other hand, the 2nd optical disc is produced, without forming an overcoat layer. Finally, by the hot melt method, adhesives are stiffened, the glue line 317 is formed and the 1st optical disc and 2nd optical disc are pasted together.

[0098]Here record of the information on the recording layer 313 which consists of a germanium-Sb-Te alloy, By irradiating with the laser beam narrowed down to fine spot, it is carried out to an irradiation part using a local change arising, i.e., the difference in the optical characteristic based on the reversible structural change with the atom level between a crystal phase and an amorphous phase arises. The recorded information is reproduced by detecting the difference of the reflected light quantity or the transmitted light amount to specific wavelength.

[0099]Next, the BCA memory to a phase-change optical disk like DVD-RAM is explained. First, the record film shown in (c) of drawing 15 is an amorphous state called an ASDE POJITTO state at the time of film formation. Although this state is based also on a membranous optical design, it usually shows low reflectance. It will crystallize, if it is made to dissolve by laser radiation, and this kind of phase-change optical disk serves as high reflectance. Actually, the whole surface is irradiated with laser, the optical disc after a film production process is crystallized, and an optical disc is shipped where high reflectance is used. This process is called initialization process. reading the information to record of an address, a track, etc. that the high reflectance is more indispensable -- ** and ** -- I am easy -- since -- it is .
[0100]There are two methods in BCA record of a phase-change optical disk. The 1st method is a method of hitting laser to the field which are an YAG laser and high output semiconductor laser and in which the optical magnetic recording medium has become the same a crystal phase. A laser irradiation part changes with rises in heat from a crystal phase with high reflectance to an amorphous phase with low reflectance. Since a part of recording layer or reflecting layer will move by fusion or sublimation if laser power is strengthened further, the reflectance of a laser radiation portion becomes low compared with a non-irradiation part. In this way, since a portion with high reflectance and a low portion are formed, a BCA regenerative signal as shown in (4) of (c) is reproduced by the optical head of a DVD drive. [of drawing 1]
[0101]When the 2nd method is explained, in a phase change type disk, at the time of manufacture, when a recording layer is formed by sputtering etc., it is an amorphous state called an AZUDEPO state, and is low reflectance. By giving a reversal record signal as shown in (7) of (c), laser is not irradiated with the stripe part of BCA, but while it has been an amorphous state, i.e., low reflectance, it remains. [of drawing 1] On the other hand, since it will be in a crystallized state since laser is irradiated with a non-BCA stripe part, and it becomes high reflectance, the regenerative signal with which the signal level fell [the BCA stripe part] as shown in (4) of (c) is acquired. [of drawing 1] In the 2nd method, since BCA is recordable only by turning on and turning off laser radiation in an initialization process as shown in (7) of (c), a process is simplified. [of drawing 1]
[0102]Here, the tolerance level which can reproduce a BCA signal is described. Drawing 16 shows the composition of the regenerative circuit of BCA. BCA carries out superposition record on EMPOSUPITTO. For this reason, as the regenerative signal from an optical head is shown in (1) of drawing 17, the EMPO spit ****** quantity region noise has ridden. As for this noise, a high region noise component is removed by LPF161 of 1.2MHZ, and reversal amplification of the cut off frequency fc is carried out with the amplifier 162. This signal is removed by HPF163 of fc=14KHZ in a noise low-pass [accompanying eccentricity], and the 2nd slice level that made the average output of the peak value of BCA the abbreviation half is created by the peak hold circuit of 320 microseconds of damping time constants. In the comparator 165, the reverse signal (3) of the regenerative signal of BCA is compared with this 2nd slice level (2), and binary data as shown in (4) is outputted. In this way, a BCA signal is reproduced.
[0103]Here, the antecedent basis which set the cut off frequency fc of LPF161 to 1.2MHZ is described. Drawing 18 shows an abnormal-conditions noise when BCA is recorded to a phase change type DVD-RAM disk. IBM_{max} shows, the maximum, i.e., the worst value, of a signal of a BCA stripe mark part after LPF conversion of the signal of (1) of drawing 17. IBS_{min} shows, the minimum, i.e., the worst value, of a signal of the non-BCA section. Since the slice margin at the time of reproduction is required not less than 20%. Unless IBM_{max}/IBS_{min} is 0.8 or less, it cannot restore to BCA with playback equipment. Drawing 18 is the result of changing fc of LPF and surveying the value of IBM_{max}/IBS_{min}. When fc uses 1.2 or more MHZ shows becoming 0.8 or less. Thus, by making IBM_{max}/IBS_{min} of BCM of setting fc of LPF of playback equipment to

1.2 or more MHZ, and a disk or less into 0.8, it is effective in the ability of BCA to be stabilized and reproduced.

[0104]The record method of the postscript information in this embodiment is the same as that of the case of a 1st embodiment almost. That is, using a one-way convergent lens like high output laser, such as an YAG laser, and a cylindrical lens, the laser beam of rectangular stripe shape is completed on the recording layer 313, and two or more BCA sections 310 are recorded on a disk circumferencial direction. If a high-output laser beam is irradiated with the optical disc of this embodiment by the recording layer 313 rather than the time of main information record, the structural change by excessive crystallization by a phase transition will produce it. For this reason, it becomes possible to record the BCA section 310a and b irreversibly, and if high power is irradiated further, the record film 313 will be removed. Thus, as for the BCA section 310a and b, being recorded as an irreversible state of a crystal phase is preferred. And since reflected light quantity changes by the BCA section 310a of the BCA field where postscript information was recorded by doing in this way and recording the BCA section 310a and b, b and the non-BCA section 310c, and d, postscript information is renewable by the optical head of the playback equipment of DVD-ROM. In this case, as for change of the reflected light quantity from an optical disc, it is preferred that it is not less than 10%, and change of reflected light quantity can be set up to not less than 10% by making change of an average refractive index into not less than 5%. In the case of DVD-RAM, it not only produces an excessive structural change of a recording layer, but it enables change of the reflected light quantity by the signal in a BCA field to use beyond a predetermined value by making a part of protective layer or reflecting layer suffer a loss as well as DVD-ROM. Since it is lamination structure at this time, it is satisfactory also in reliability.

[0105]As explained above, the recorder and record method of postscript information in a 2nd embodiment are the same as that of a 1st embodiment. However, in a 1st embodiment, in order for beyond a predetermined value to change reflected light quantity by this embodiment to degrading only the magnetic anisotropy of a recording layer, the record power of postscript information differs from setting out of a recording condition. Even if it is a case where it is set as the same record power, or in the case of a magneto-optical disc it carries out out of focus and records, it may be the method of reducing record power via a filter and recording.

[0106]In high-density magneto-optical discs, such as ASMO, since playback of postscript information is performed using the optical head 155 of composition of being shown in drawing 8, the composition of an optical head, the detecting method of a record signal, and a reproduction condition differ from the recording and reproducing device of this embodiment. However, also in this embodiment, the copyright of the main information in a disk can be powerfully managed and protected by using an output inhibition field into postscript information in the same procedure as the flow chart explained by a 1st embodiment.

[0107]Like a magneto-optical disc or DVD-RAM, even if it is an optical disc not only like an erasable optical disc but DVD-ROM or DVD-R, The playback equipment of the optical disc and optical disc which can prevent protection of the file using postscript information and an unjust copy is realizable by using the information signal which is output inhibition at the time of playback, and was enciphered as CDC in postscript information peculiar to a disk.

[0108]Next, the means of a content provider's contents which carries out management protection is actually explained. First, the procedure to disk production in which contents entered is explained using drawing 19. As shown in drawing 19, in the disk manufacture department 19, first, with MPEG encoder 4, variable length coding of the original contents 3, such as a movie, is blocked and carried out, and they serve as compression video signals, such as MPEG by which graphical data compression was carried out. Scramble is applied with

the code encoder 14 using the encryption key 20 with which this signal is produced by a BCA signal. This compression video signal by which scramble was carried out is recorded as a pit-like signal on the original recording 6 by the original recording production machines 5. By this original recording 6 and making machine 7, a lot of disc substrates 8 on which the pit was recorded are manufactured, and reflection films, such as aluminum, are formed by the reflecting layer molding machine 15. The disc substrates 8 and 8a of two sheets are pasted together, it pastes together by the opportunity 9, and the lamination disk 10 is completed. In the case of a magneto-optical disc, the compression video signal by which scramble was carried out [above-mentioned] is recorded by the recording layer as a magneto optical signal. In the case of the disk of single plate structure, the disk 140 is completed without lamination. In the case of DVD-RAM300, the compression video signal by which scramble was carried out [above-mentioned] is similarly recorded on a recording layer, the disc substrate of two sheets pastes together, it is stuck by the opportunity 9, and a lamination disk is completed. Two kinds of disk configurations, the single type which has a recording layer only on one side, and the double type which has a recording layer to both sides, are possible at DVD-RAM300. It is producible in a similar way also about a DVD-R disk.

[0109]Next, a content provider explains the regeneration method of the disk by recording postscript information. Drawing 20 is a block diagram of a disk manufacturing installation and playback equipment. The ROM type of the same contents, a RAM type lamination disk, or the single plate disk 10 is manufactured by the disk manufacture department 19. In the disk manufacturing installation 21, the disks 10a, 10b, and 10c, The identification signals 12a, such as ID which use the BCA recorder 13 for ... and is different for every one one-sheet disk, PE abnormal conditions are carried out by the PE modulation part 410, laser trimming of the BCA data 16a, 16b, and 16c containing 12b and 12c is carried out using an YAG laser, and BCA18a of circular barcode form, and 18b and 18c are formed on the disk 10. Hereafter, the entire disk on which BCA18 was recorded is called the BCA disks 11a, 11b, and 11c. As shown in drawing 20, the pit section or record signal of these BCA disks 11a, 11b, and 11c is completely the same. However, for every disk, different ID from 1, 2, and 3 is enciphered by BCA18, and it is recorded on it as information on output inhibition. Content providers, such as a movie company, memorize this different ID to ID database 22. BCA data is simultaneously read with the bar code reader 24 which can read BCA at the time of shipment of a directory, Which system operator 23, and the supply destination and feed time of whether to have supplied the CATV company, the broadcasting station, and the airline by getting it blocked are memorized for the disk of which ID to ID database 22.

[0110]Record of to what system operator to have supplied the disk of which ID when is recorded on ID database 22 by this. The BCA disk of a particular application is producible by setting up by encryption of ID, or the content provider of information who forbade the output at the time of playback, and when prevention of an illegal copy or an illegal copy appears on the market in large quantities, the supplied BCA disk 11 can be traced and specified.

[0111]As mentioned above, although the case where only contents are supplied with CATV etc. has been explained, when selling the disk with which the BCA signal which has recorded contents was recorded, protection of contents can be performed similarly.

[0112]What is necessary is just to use the recording and reproducing device of a 1st embodiment, and the recording and reproducing device of the same composition, in selling the BCA disk of drawing 20 to a general user. At this time, as shown in the flow chart of drawing 10 and drawing 11, the ID information which the output inhibition field of the above-mentioned BCA disk enciphered is read, A secret key can be produced within a recording and reproducing device, and the copyright of a disk can be protected with the

same recording and reproducing systems as a 1st embodiment of decoding a protection file.
[0113]If it is a method which provides a secret key using a communication line, it will become manageable [more positive contents]. That is, with the flow chart of drawing 10 and drawing 11, when media ID etc. as which (Step 301i) was enciphered are reproduced, a communication line is used for a content provider or a soft management agent, and reproduction information is sent to him. If it does so, by the content provider side, a decipherment and collation of the code of media ID information are performed, and if it is a regular disk, the information about the secret key of which the scramble of contents is canceled will be supplied. Using the information about the secret key, the file of the contents protected is decoded and it reproduces (3011. of steps). since [in this case,] postscript information peculiar to each contents, such as disk ID, is always manageable -- use of unjust postscript information -- ** -- it can discover easily.
[0114]If enciphered media ID is recorded on BCA where correlation is completely abolished with disk ID and a cipher system, it will become impossible in this case, to guess by an operation from ID. That is, only the owner of a copyright will know the relation between ID and its encipherment arithmetic. For this reason, an illegal copy contractor can be prevented from publishing unjustly the information which enciphered new ID or it.
[0115]It can encipher by generating a spectrum signal using a specific operation from information peculiar to users, such as card ID of an IC card, and adding to ID signal 38 of a disk. In this case, since both personal information of media ID and a user needs to be compared, issue of unjust ID information becomes still more difficult. And since the owner of a copyright can check the both sides of soft circulation ID and ID of playback equipment, it becomes easy [pursuit of an illegal copy, i.e., trace,] further [him].
[0116]In other methods of protecting contents. As shown to the Records Department of the recording and reproducing device of drawing 21, in recording main information, such as a video signal, on the disk 140 which recorded BCA, First, the BCA signal containing different disk ID for every optical disc is read by the BCA regenerating section 39, By superimposing as a watermark the signal produced with the BCA signal of postscript information, a video signal is changed and the video signal after conversion is recorded on the BCA disk 140 (10, 300). For example, a watermark is produced based on disk ID. In playing a video signal from the BCA disk 140 (10, 300) with which the video signal with which it was superimposed on the BCA signal was recorded, first, the BCA signal of a disk is read by the BCA regenerating section 39, and it detects as ID1 of a disk, and produces a secret key. the method of producing a secret key at this time -- the inside of a recording and reproducing device -- it is compared and supplied. A system operator or a software management contractor may perform collation of this secret key, production, and supply using a communication line.
[0117]Next, the information peculiar to a disk on which the video signal was overlapped is detected as disk ID2 by the watermark regenerating section which restores to a watermark. When the secret key produced from BCA signal ID1 is compared in disk ID2 read in the superimposing signal of a video signal and a secret key is not in agreement with a superimposing signal, playback of a video signal is suspended. As a result, it is copied unjustly and a video signal cannot be played from the disk with which it was superimposed on a different signal from the information hidden in the BCA signal. On the other hand, when both are in agreement, by the descrambler 31, using a decode key including the ID information read from the BCA signal, the releasing scramble of the video signal with which it was superimposed on the watermark is carried out, and it is outputted as a video signal.
[0118]In sending video information by the above methods using a communication line, The BCA disks 10a, 10b, and 10c included the BCA information enciphered by the disk manufacturing installation 21 of drawing

20 are sent to the system operators' 23a, 23b, and 23c playback equipment 25a, 25b, and 25c.
[0119]Here, the operation by the side of a system operator is explained using drawing 22. Drawing 22 is a block diagram showing the details of a retransmission-of-message device. Drawing 23 is a figure showing the waveform on the time-axis of the HARASHIN item and each video signal, and the waveform on a frequency axis. As shown in drawing 22, the playback equipment 25a only for a system operator is formed in the retransmission-of-message device 28 installed in a CATV station etc., and this playback equipment 25a is equipped with the BCA disk 11a supplied by the movie company etc. The data reproducing part 30 is reproduced and the main information of the signals reproduced by the optical head 29 is sent to the descrambler 31. Here, if mutual recognition was carried out with the descrambling key created by information peculiar to users, such as card ID of an IC card, after scramble will be canceled and the HARASHIN item of a picture will be elongated by MPEG decoder 33, it is sent to the watermark part 34. In the watermark part 34, the HARASHIN item shown in (1) of drawing 23 is inputted first, and it is changed into a frequency axis from a time-axis by the frequency conversion parts 34a, such as FFT. Thereby, the frequency spectrum 35a as shown in (2) of drawing 23 is obtained. The frequency spectrum 35a is mixed with the ID signal which has a spectrum shown in (3) of drawing 23 in the spectrum mixing parts 36. The spectrum 35b of the mixed signal is not different from the frequency spectrum 35a of the HARASHIN item shown in (2) of drawing 23, as shown in (4) of drawing 23. That is, it means that the spread spectrum of the ID signal was carried out. This signal is changed into a time-axis from a frequency axis by the reverse frequency conversion parts 37, such as IFFT, and the signal which is not different from the HARASHIN item ((1) of drawing 23) as shown in (5) of drawing 23 is acquired. Since the spread spectrum of the ID signal is carried out in frequency space, there is little degradation of a picture signal.
[0120]In drawing 22, the video output signals of the watermark part 34 are sent to the outputting part 42. When transmitting the video signal with which the retransmission-of-message device 28 was compressed, compression is applied with MPEG encoder 43, the scramble of the video output signals is carried out by the scrambler 45 using the encryption key 44 peculiar to a system operator, and it transmits to a televiewer via a network or an electric wave from the transmission section 46. In this case, since the compression parameter information, including the transfer rate after the original MPEG bit reduction, etc., 47 is sent to MPEG encoder 43 from MPEG decoder 33, compression efficiency can be raised even if it is real-time encoding. By making the watermark part 34 bypass, since a sound and the compression audio signal 48 will not be elongated and compressed, audio degradation of them is lost. Here, in not transmitting a compression signal, the scramble of the video output signals 49 is carried out as it is, and it transmits from the transmission section 46a. In the show system in an airplane, scramble becomes unnecessary. Thus, the video signal containing a watermark is transmitted from the disk 11.
[0121]In the device of drawing 22, when a dishonest businessman extracts the signal between each block from an intermediate bus, the watermark part 34 may be bypassed and a video signal may be taken out. In order to prevent this, the bus between the descrambler 31 and MPEG decoder 33 is enciphered by the mutual recognition part 32a, the mutual recognition part 32b and the mutual recognition part 32c, and the mutual recognition part 32d by the handshake method. while receiving the encryption signals which enciphered the signal by the mutual recognition part 32c of the transmitting side in the mutual recognition part 32d of a receiver -- the mutual recognition part 32c and the mutual recognition part 32d -- mutual -- communication -- that is, a handshake is carried out. In the mutual recognition part 32d of a receiver, this result cancels a code only to a right case. The same may be said of the case of the mutual recognition part 32a and the mutual recognition part 32b. Thus, in this method, since a code is not canceled unless it is attested mutually, even if

it extracts a digital signal from an intermediate bus, a code is not canceled and cannot bypass the watermark part 34 eventually. For this reason, unjust exclusion and alteration of a watermark can be prevented.
[0122]Here, the manufacturing method of the signal 38 about ID information is explained. A signature is compared by the public key etc. to which the BCA data played by the BCA regenerating section 39 from the BCA disk 11a was sent from IC card 41 etc. in the digital signature collating part 40. In the case of NG, operation stops. Since data is not altered in O.K., ID is sent to the watermark data creation part 41a as it is. It is made to generate here using the enciphered information signal which is included in BCA data as a signal of the watermark corresponding to the ID signal shown in (3) of drawing 23. Since this postscript information is not outputted out of a drive with a recording and reproducing device with a deer, processing of a signal and an alteration cannot be performed. An operation may be performed from card ID of ID information or IC card 41 also here, and the signal of a secret key may be generated.
[0123]As shown in drawing 24, when an illegal copy is carried out by the user side, it is recorded on the videotape 56, a lot of videotape 56 by which the illegal copy was carried out appears on the market at a world, and, as for the video signal 49a, VTR55 infringes on right of an owner of a copyright. However, when BCA of this invention is used, the watermark on which the video signal 49b (refer to drawing 25) played by the video signal 49a from the videotape 56 was also overlapped sticks. Since it is added in frequency space, a watermark cannot be erased easily. It does not disappear, even if it lets the usual recording and reproducing system pass.
[0124]Here, the detecting method of a watermark is explained using drawing 25. The media 56 by which the illegal copy was carried out, such as videotape and a DVD laser disc, It is reproduced with the playback equipment 55a, such as VTR and a DVD player, and the reproduced video signal 49b is inputted into the 1st input part 58 of the watermark sensing device 57, The 1st spectrum 60 that is the spectrum of the signal by which the illegal copy was carried out as shown in (7) of drawing 23 by the 1st frequency conversion part 59a, such as FFT and DCT, is obtained. On the other hand, the original original content 61 is inputted into the 2nd input part 58a, it is changed into a frequency axis by the 2nd frequency conversion part 59a, and the 2nd spectrum 35a is obtained. This spectrum becomes as shown in (2) of drawing 23. the difference of the 1st spectrum 60 and the 2nd spectrum 35a -- difference -- if it takes with the vessel 62, the difference spectrum signal 63 of drawing 23 as shown in (8) will be acquired. This difference spectrum signal 63 is made to input into ID detection section 64. In ID detection section 64, the watermark parameter 65 of eye ID=n watch is taken out from ID database 22 (Step 65), It is inputted (Step 65a) and the spectrum signal 65a and the difference spectrum signal 63 based on a watermark parameter are compared (Step 65b). Subsequently, it is distinguished whether the spectrum signal based on a watermark parameter and the difference spectrum signal 63 are in agreement (Step 65c). Since it turns out that it is a watermark of ID=n if both are in agreement, it is judged as ID=n (Step 65d). When both are not in agreement, ID is changed into (n+1), the watermark parameter of eye ID= (n+1) watch is taken out from ID database 22, the same step is repeated, and ID of a watermark is detected. ID of a spectrum corresponds with a right case, as shown in (3) of drawing 23, and (8). In this way, ID of a watermark is outputted from the outputting part 66, and the source of an illegal copy becomes clear. Since the source of a pirated disk or the contents of an illegal copy can be pursued by specifying ID of a watermark as mentioned above, copyright is protected. Although this embodiment explained using the watermark part of a spectrum spreading system, the same effect is acquired even if it uses other watermark methods.
[0125]In the case of the DVD-RAM disk 300 or RAM disk 140a like the magneto-optical disc 140, In content providers, such as a CATV station with the DVD recording and reproducing device or magneto-

optical recording playback equipment shown in drawing 7, The ID number which is a unique media ID number in enciphered BCA as one key, The enciphered scramble data is sent to another recording and reproducing device by the side of a user via a communication line from a content provider, and is once recorded on RAM disks, such as a CATV station, or phase change type RAM disk 140a.

[0126]In the case of a simple system, a user's recording and reproducing device may perform encryption, i.e., scramble. It explains, although a part of this structure is overlapped. In this case, in the recording and reproducing device of drawing 7, each operation is carried out according to the copyright protection level of an input signal. There are three kinds of identifiers of a copy freelancer, copy once which permits an one-generation copy, and the NEBA copy of copy prohibition in a copyright protection level, and the input signal is overlapped on these identifiers by data or a water mark. By detecting the watermark of an input signal by the watermark regenerating section 263, three kinds of identifiers are discriminable. First, when copy-free, it records without applying scramble, and in a NEBA copy, the record prevention parts 265 operate and record is stopped. In the case of copy once, unique disk ID is read out of BCA, it is this disk ID, and after carrying out the scramble of the input signal, it is recorded on a RAM disk. It explains in detail below.

[0127]First, BCA data is played by the optical head 29 from the disks 140a, such as a phase change type RAM disk of DVD-RAM, and an optical magnetism type RAM disk, BCA is played and BCA data is outputted by the PE-RZ demodulation section 350a and ECC decoders 530b from the BCA outputting part 550. Into 188 bytes of BCA data, 64-bit (8 bytes) record of unique disk ID is carried out, for example, and this disk ID is outputted.

[0128]When recording the input signal of copy once, the scramble of the MPEG video signal is carried out in the scramble part 271 in the record circuit 266, using this disk ID as one of the keys. And scramble-ized picture image data is made into a record signal by the Records Department 272 including a record circuit, and it is recorded on RAM disk 140a by the optical head 29.

[0129]Since it is regular directions for use when reproducing this scramble signal, As shown in drawing 7, read BCA and a secret key is produced from the enciphered BCA data which was obtained from the BCA outputting part 550, Scramble is canceled in the descrambling part 534a, i.e., a code decoder, using unique disk ID or secret key in BCA data as one key. And an MPEG signal is elongated by MPEG decoder 261, and a video signal is obtained. However, when the scramble data recorded on RAM disk 140a produced with regular directions for use is copied to another RAM disk 140b (i.e., when it is used for injustice). Since the BCA data of a disk differs when it plays, the right key for undoing scramble data is not obtained, and scramble is not correctly canceled by the code decoder 534a. For this reason, a video signal is not outputted. Thus, since the signal unjustly copied to RAM disk 140b of the second generation after the 2nd sheet is not played, the copyright of the contents to which the watermark of copy once was added is protected. As a result, contents cannot carry out record reproduction only to RAM disk 140a of one sheet. Record reproduction can be carried out only to the DVD-RAM disk of one sheet similarly [in the case of the DVD-RAM disk 300 shown in (a) of drawing 15, and (c)]. Since the BCA signal enciphered by furthermore enciphering BCA is not outputted from a recording and reproducing device, only BCA data can be outputted and taken out, and the above-mentioned secret key cannot be decoded or changed, and it cannot create in addition, either.

[0130]In protecting the software furthermore strengthened, it sends the BCA data of RAM disk 140a by the side of a user to the content provider side via a communication line first. Next, at the watermark Records Department 264, as a watermark, a video signal is embedded and this BCA data is transmitted in the content provider side. In the user side, this signal is recorded on RAM disk 140a. At the time of reproduction, in the

watermark reproduction collating part 262, record permission identifiers, and the BCA data of a watermark, etc. and the BCA data obtained from the BCA outputting part 550 are compared, and only when in agreement, decoding reproduction is permitted. Thereby, protection of copyright becomes still stronger. In this method, since a watermark is detectable by the watermark regenerating section 263 even if digital one / analog copy is directly carried out from RAM disk 140a at a VTR tape, a digital illegal copy can be prevented or detected. Prevention or detection of a digital illegal copy can be performed similarly [in the case of the DVD-RAM disk 300a shown in drawing 7].

[0131]Here, protection of software is strengthened more by forming the watermark regenerating section 263 in magneto-optical recording playback equipment or a DVD recording and reproducing device, and adding the enciphered information which shows "a 1-time recordable identifier" to the signal received from the content provider. It will be prevented by the record prevention parts 265 and "the identifier recorded [1 time]" if record carries out for granting a permission by the record prevention parts 265 at this time, the 2nd record, i.e., illegal copy, to a disk.

[0132]The individual disk number of the identifier which shows "finishing [1 time record]", and RAM disk 140a beforehand recorded on the BCA Records Department 120 by the watermark Records Department 264. As a watermark, it can superimpose on a record signal further, can embed to it, and can also record on RAM disk 140a.

[0133]It is also possible to give the key to which the day entry permitted by system operators, such as a rental store, was added from the hour entry input part 269 to a watermark and the key of scramble in the scramble part 271, or to use the signal compounded in a password as postscript information. If reproduction collation of the day entry is carried out by the playback equipment side using a password, BCA data, or a watermark at this time, in the code decoder 534a, it is also possible to restrict the period of a scramble key which can be canceled, for example like "being usable for three days." Since it is the postscript information which is not outputted from playback equipment, it can also be used for the rental disk system included such a hour entry. Also in this case, a copy is prevented further, copyright protection is powerful and an unauthorized use becomes very difficult.

[0134]As shown in the record circuit 266 of drawing 7, both sides are checked by the watermark regenerating section 263 of playback equipment by using BCA data for some encryption keys of scramble, and using BCA data for the primary enciphered postscript information and the secondary enciphered postscript information. An illegal copy can be prevented thereby still more powerfully.

[0135]As described above, even if it is a rewritable optical disc like the magneto-optical disc or DVD-RAM used for ASMO, the copyright protection using a watermark or scramble is strengthened more by using the characteristic data which cannot output the postscript information on this invention.

[0136]The postscript information in the above-mentioned embodiment can perform the format of an information signal, etc. in common in a DVD disk and a magneto-optical disc. For this reason, with the reproduction procedure of postscript information as shown in the flow chart of drawing 10 and drawing 11, if it is an optical disc which is compatible with the recording and reproducing device of the same composition, with regards to that kind, protection of contents and management can be performed in common [there is nothing and]. Therefore, a reliable optical disc and its recording and reproducing device are realizable.

[0137]If the payment method of the fee from an IC card, etc. are combined with transmission of the postscript information to which the output for every software to be used or contents was forbidden, and offer of the information about the secret key from a content provider, The pay-per-view of video information, etc. become realizable [the accounting system for every contents]. Setting out for every optical disc is attained

also about the charging method for use of contents using the postscript information to which the output was forbidden.

[0138]In the included write once optical disk or a rewritten type optical disc, and a recording and reproducing device, the postscript information to which the output was forbidden The data file of the information on individual management, Or if an employee's individual information is added as a system used in a company and it enciphers, it will become possible to setting out of the right to access for every optical disc used for personal data or the data file of the information in a company. Especially access from the outside to the data file by which the security of the information protected in addition to specific users, such as information about individual privacy, is able to realize the system strengthened more, was protected in this way, and protection management was carried out becomes very difficult.

[0139]By the system which combined the BCA information enciphered in the postscript information on this invention, and a secret key. If the same signal as a ROM disk or a RAM disk is superimposed on a video signal and recorded, A virtual watermark can be realized and the watermark equivalent to the ID information which the content provider published altogether will be embedded by using the optical disc and playback equipment of this invention as this result at the video signal outputted from playback equipment. Compared with the method of managing a video signal for every conventional disk, the costs and production time of a disk are substantially reducible.

[0140]In the above-mentioned embodiment, it explained using the ROM disk of DVD of a two-sheet bonding type, the RAM disk, or the optical disc of single plate structure. However, according to this invention, it cannot be based on the composition of a disk but the same effect can be acquired over a disk at large. That is, also in other ROM disks and RAM disks or a DVD-R disk, and a magneto-optical disc, even if it reads each explanation as a DVD-R disk, a DVD-RAM disk, and a magneto-optical disc, the same effect is acquired, but the explanation is omitted.

[0141]In the above-mentioned embodiment, the recording layer mentioned as the example the magneto-optical disc which consists of a three-tiered structure of a CAD method, and explained it. However, they may be a magneto-optical disc in which magnetic-super-high-resolution playback of an FAD method, a RAD system, or a double mask method is possible, the conventional magneto-optical disc, or a magneto-optical disc of the method which expands a recording magnetic domain and is played. Even if it is the conventional optical disc, DVD-ROM, DVD-RAM, DVD-R, and the composition that reads the information on the recording layer more than two-layer from one side further for densification, With the above-mentioned disk configuration and play back system of postscript information, since the management information of the software of an optical disc is easily recordable on postscript information, the outstanding optical disc which can prevent the duplicate of contents can be provided.

[0142]Although the embodiment of the invention explained the optical disc, it can develop also to the magnetic tape and the optical tape which are other recording media, a magnetic disk and an optical card, a magnetic card, and a semiconductor memory device, and it is obvious that it is the range of this invention.

[0143]

[Effect of the Invention]As explained above, according to this invention, protection management of the copyright of software can be performed easily and the composition using the postscript information on an optical disc and the above-mentioned simple method enable the very powerful duplicate of contents to realize a preventive measure.

CLAIMS

[Claim(s)]
[Claim 1]An optical disc comprising provided with a recording layer which records information on a disc substrate:
The 1st record section where a recording layer recorded contents data and data for the record reproduction.
The 1st classification that is equipped with the 2nd record section that records subnext data about contents recorded on the 1st record section and on which, as for the 2nd record section, CDC about the 2nd record section is recorded.
The 2nd classification on which data to which it is not prohibited from being outputted outside from a recording and reproducing device of an optical disc is recorded.
The 2nd record section classifies CDC which is provided when output inhibition data to which it should be prohibited from being outputted outside from a recording and reproducing device of an optical disc is recorded, consists of the 3rd classification on which output inhibition data is recorded, and is recorded on the 1st classification the 3rd time.

[Claim 2]The optical disc according to claim 1, wherein the 2nd aforementioned record section is a field which cannot be rewritten once it records subnext data as a mark of long stripe shape radially and writes it in.
[Claim 3]The optical disc according to claim 1 or 2 currently recorded in data for record reproduction of the 1st record section of the above [an identifier which shows whether information is recorded on the 2nd record section].
[Claim 4]The optical disc according to claim 1 or 2 currently recorded on the 1st classification of the 2nd record section of the above [an identifier which shows whether information is recorded on the 2nd record section].
[Claim 5]The optical disc according to claim 1 or 2 currently recorded in data for record reproduction of the 1st record section of the above [an identifier which shows whether data is added and recorded on the 2nd record section, and a storage capacity of data currently recorded on the 2nd record section].
[Claim 6]An optical disc given in any 1 paragraph of claims 1-5 by which enciphered data is recorded on the 3rd classification of the 2nd aforementioned record section.
[Claim 7]An optical disc given in any 1 paragraph of claims 1-6 by which different disk ID at least for every disk is recorded on the 2nd aforementioned record section.
[Claim 8]An optical disc given in any 1 paragraph of claims 1-7 by which the 2nd aforementioned record section is established in a specific part of a disk inner periphery or a disk peripheral part.
[Claim 9]The optical disc according to claim 1 in which data is recorded on the 1st record section, and data is recorded on the 2nd record section by disk radial as a mark of long stripe shape by removing said reflection film selectively by providing a concavo-convex bit in a reflection film in said recording layer.
[Claim 10]An optical disc indicated [that the 1st aforementioned record section includes a field which can rewrite information, and] in any 1 paragraph of claims 1-9 which carry out the feature.
[Claim 11]The optical disc according to claim 10, wherein the 1st aforementioned record section can record the aforementioned recording layer by an optical means.
[Claim 12]The optical disc according to claim 10 to which the 1st aforementioned record section is characterized by record and elimination of multiple times being possible by an optical means as for the aforementioned recording layer.
[Claim 13]The optical disc according to claim 10, 11, or 12, wherein the aforementioned recording layer consists of organic materials which change between two detectable states optically at least.
[Claim 14]The optical disc according to claim 12, wherein the aforementioned recording layer consists of a magnetic film which has magnetic anisotropy to a film surface perpendicular direction at least.
[Claim 15]The optical disc according to claim 14, wherein a stripe part of said 2nd record section has the magnetic anisotropy of a film surface perpendicular direction smaller than a portion between stripe parts.
[Claim 16]The optical disc according to claim 12 in which the aforementioned recording layer consists of

two or more laminated magnetic films.
[Claim 17]The optical disc according to claim 10, wherein the aforementioned recording layer consists of a thin film which may change between two detectable states reversibly optically and reflected light quantity from said 1st record section differs from reflected light quantity from said 2nd record section.
[Claim 18]The optical disc according to claim 17, wherein the aforementioned recording layer carries out a phase change reversibly between a crystal phase and an amorphous phase corresponding to exposure conditions of light irradiated.
[Claim 19]The optical disc according to claim 17, wherein the aforementioned recording layer consists of a germanium-Sb-Te alloy.
[Claim 20]The optical disc according to claim 18, wherein the 2nd record section consists of a portion between a stripe part which consists of amorphous phases, and a stripe part which consists of crystal phases.
[Claim 21]The optical disc comprising according to claim 17:
The 2nd record section is a stripe part.
A portion between stripe parts whose reflectance is higher than a stripe part.